REMARKS/ARGUMENTS

Claim Amendments

The claims have been amended to more clearly define the invention by, in each case, defining the "reactive polymeric material" as one "having reactive pendant groups chemically bonded to the polymer backbone." Support for this amendment is found in the application as originally filed, for example, in paragraph [0023]. This same paragraph provides support for new dependent claims 30 and 31.

As discussed in more detail below, it is respectfully submitted that the Examiner's characterization of Posson as disclosing a signal transmission tube "comprising a reactive polymeric material" is not correct. Posson discloses a reactive mixture of fuel and oxidizer particles bonded together by a non-reactive polymeric binder. While it is believed that Applicants' specification makes it clear that Applicants claim terminology of a "reactive polymeric material" distinguishes over the inert polymeric binder of Posson, the claims have been amended to specify that Applicants' reactive polymeric material has reactive pendant groups chemically bonded to the polymer backbone. This emphasizes the difference between Applicants' reactive polymer as claimed, and Posson's reactive mixture including an inert polymeric binder.

1. Paragraphs 2-23 below are keyed to the paragraph numbers of the DETAILED ACTION portion of the office action.

Claim Rejections Under 35 U.S.C. 102

2. Claims 7, 8, 12, 13, 15, 19 and 20 stand rejected under 35 U.S.C. 102(b) as being anticipated by Posson et al. U.S. Patent 4,220,087 ("Posson").

This ground of rejection is respectfully traversed for the reasons set forth below.

Claims 7 and 19

3. (a) As indicated above, Posson does not disclose a reactive polymeric material. Referring to column 2, line 4 *et seq.* of Posson, the fuse of Figure 1 is described as including an elongated core 16 encased within an imperforate tubular sheath 17. The core is stated to comprise three strands 18, each of which includes a plurality of supporting strands 19 "coated with a non-detonative, ignitive mixture of powdered fuel, oxidant and a suitable binder." At column 2, lines 12-21, suitable powdered fuels (aluminum, titanium, magnesium, etc.) and suitable oxidants (potassium perchlorate, ammonium perchlorate, etc.) are described.

(b) Starting at line 22 of column 2, Posson states that a wide variety of polymeric binders with suitable properties are available, and that "the binder is chosen to provide compatability with the fuel and oxidant combination, as well as to provide the desired adhesion, mechanical strength, and storage capability." Examples of binders are polyethyl acrylate (Example 1) dissolved in various solvents (Examples 1 and 2), and Hycar® 2671 emulsion (Example 3). Hycar® 2671 is an acrylic emulsion sold by Lubrizol Advanced Materials, Inc. ("Lubrizol") of Cleveland, Ohio. As shown at page 1 of the attached June 4, 2007 specification sheet for this product (downloaded from Lubrizol's web site on April 22, 2011), chemical (and mechanical) stability are good and among the suggested applications is "pigment binding". It is seen that none of the polymer components of Posson's pulverulent fuel/oxidizer mixtures is a reactive polymeric material as defined in Applicants' claims. Rather, Posson discloses only a reactive fuel/oxidizer mixture, which includes (an inert) polymer binder.

(c) The Examiner appears to recognize the difference between the claims and Posson, in his statement that the rod portion of Posson "is taught to be a solid reactive formulation of a polymeric material binder with a fuel and oxidizer mixture", citing column 2, lines 1-26 of Posson. The Examiner here implicitly acknowledges Posson's non-reactive polymeric binder. The reactive properties of Posson's formulation are solely those of the powdered fuel and oxidizer.

(d) Although in some embodiments the Applicants' invention provides for supplementing the reactive polymeric material with a fuel and oxidizer embedded within the polymer, that is not necessary to the practice of Applicants' invention and in all cases of the Applicants' invention, as clearly defined in the claims, the polymeric material itself, with or without embedded fuel and oxidizer, is reactive. That is not the case with Posson. The distinction is clarified by the within amendment which specifies that Applicants' reactive polymer has reactive pendant groups chemically bonded to the polymer backbone.

Claim 8

4. The Examiner contends that Posson discloses the interior of the confinement tube as substantially free of unembedded pulverulent reactive material. But this does not remedy Posson's failure to show or suggest the use of a reactive polymeric material, as distinguished from a reactive material which includes a non-reactive polymeric binder. The presence of a reactive polymeric material is required in dependent claim 8. Further, at column 2, lines 39-61, Posson discloses that an adherent powdery ignition layer 23 is formed on a majority of the interior surface of the

sheath (see Figure 1). This adherent layer 23 may be composed of the same materials as strands 18 with an optionally reduced or zero content of binder and solvent. In the absence of the binder and solvent it appears that the material of the confinement tube, especially when subject to handling and shipping, will probably have unembedded reactive material therein. In any case, layer 23 may also contain organic polynitrocompounds such as TNT, etc., i.e., high explosive powders.

Claim 12

5. Applicants do not rely for patentability on the particular configuration of the rod; dependent claim 12 merely defines a preferred embodiment to provide the continuous longitudinally extending unoccupied portion.

Claim 13

6. The same comment applies here as made above with respect to claim 12.

Claims 15 and 20

7. The Examiner again incorrectly ascribes to Posson a tube consisting of a reactive polymeric material. As noted above, Posson teaches only a reactive fuel-oxidizer formulation utilizing a non-reactive polymeric binder.

Claim Rejections Under 35 U.S.C. 103

8. Claims 9, 24 and 25 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Posson in view of Manzara et al. U.S. Patent 5,681,904 ("Manzara").

This ground of rejection is respectfully traversed for the reasons set forth below.

Claims 9 and 24

9. (a) Manzara discloses GAP polymers but fails to remedy the deficiency of Posson. As noted above, Posson's polymeric materials are simply non-reactive polymeric binders which (column 2, lines 23-26) are "chosen to provide compatability with the fuel and oxidant combination, as well as to provide the desired adhesion, mechanical strength, and storage capability." As would anyone in manufacturing a fuse, Posson is concerned with the brisance characteristics of the fuse; see column 4, lines 39-42 wherein a Posson fuse was tested by being taped to an unsupported sheet of aluminum and ignited. This test showed no visible deformation of a thin (0.040 inch) sheet of soft aluminum. Similarly, Posson is appropriately concerned

with toxicity of the gases and combustion products generated by igniting his fuse. See column 4, lines 43-48. Posson's carefully formulated fuse compositions would have their desired brisance and toxicity characteristics wildly altered by replacing the non-reactive polymeric binder of Posson with Manzara's reactive GAP polymer. Such substitution would severely affect the brisance and other characteristics of Posson's formulations.

(b) Therefore, not only would one skilled in the art not be led to substitute or add Manzara's GAP material to Posson's formulation, but in fact would be led away from making such substitution or addition in order to avoid radically upsetting Posson's careful formulations.

(c) Further, it is noted that the Examiner states that it would be obvious "to utilize any of various reactive materials as the energetic material of Posson including GAP such as described by Manzara..." But, as repeatedly stated above, the polymeric binder of Posson is not an energetic material replaceable by another energetic material, but an inert binder.

Claim 25

10. The Examiner's statement that Posson as modified by Manzara discloses a GAP resin that has been cross-linked by a multifunctional dipolarophile material is not supported by the disclosure of these combined references. Manzara discloses a GAP material cross-linked by a multifunctional dipolarophile material. Posson discloses only a non-reactive polymeric material binder.

11. Claims 1, 2, 14, 26 and 27 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Posson in view of Woodall et al. U.S. Patent 6,694,886 ("Woodall").

This ground of rejection is respectfully traversed for the reasons set forth below.

Claims 1 and 14

12. (a) As indicated above, the Examiner's contention that the rod of Posson is "comprised of a solid reactive polymeric material" is incorrect and is not supported by the disclosure of the reference. Characterizing the rod of Posson as a solid reactive polymeric material is quite different from the Examiner's statement that the rod portion of Posson "is taught to be a solid reactive formulation of a polymeric material binder with a fuel and oxidizer mixture..." Here, the Examiner has been more pre-

cise[1] in his description of Posson than elsewhere in the office action, recognizing that "a reactive polymeric material" is not the same as "a solid reactive formulation of a [non-reactive] polymeric material binder with a fuel and oxidizer mixture..." The two are not the same and are, in fact, quite different materials for the reasons discussed at length above.

(b) Woodall is cited in order to overcome the acknowledged deficiency of Posson of failing to explicitly teach that a confinement tube is extruded over the rod. It is respectfully submitted that whether or not the teaching of Woodall renders obvious the over-extrusion aspect alone of the rejected claims, is not really material to the issue of patentability. Applicants rely for patentability on the failure of Posson or any combination of Posson with the other references cited herein, to show or suggest the use in a signal transmission tube as defined of a reactive polymeric material having reactive pendant groups chemically bonded to the polymer backbone.

Claim 2

13. The same comments apply here as made in paragraph 4 above with respect to the rejection of claim 8.

Claims 26 and 27

14. As indicated above in paragraph 12, it is respectfully submitted that this rejection cannot stand because, contrary to the Examiner's statement, Posson does not teach a signal transmission tube "comprising a reactive polymeric material", in tubular form or otherwise. Both claims 26 and 27 now require the presence of a reactive polymer having reactive pendant groups.

15. Claims 3, 4, 28 and 29 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Posson and Woodall as applied to claim 1 (paragraph 12 above) and further in view of Manzara.

This ground of rejection is respectfully traversed for the following reasons.

Claims 3 and 28

16. The rejection of claims 3 and 28 is based on the combination of Posson and Manzara. However, that combination fails to render these claims obvious for the reasons set forth in detail elsewhere herein, for example, at paragraph 9 above, with respect to claims 9 and 24.

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[1] The precision of the Examiner's quoted statement would be enhanced by inserting the word "non-reactive" or "inert" before the term "polymeric material".

Claims 4 and 29

17. This combination of references fails to sustain a rejection under 35 U.S.C. 103(a) for the reasons noted in paragraph 9 above. These dependent claims incorporate by reference the reactive polymeric material defined in the claims from which they depend.

18. Claims 5 and 10 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Persson et al. U.S. Patent 3,590,739 ("Persson et al.") in view of Manzara.

This ground of rejection is respectfully traversed for the following reasons.

Claims 5 and 10

19. (a) Persson is a pioneer patent in the field of shock tubes. As disclosed at column 2, lines 43-44, a thin layer 18 of an explosive or reactive substance is disposed on the interior wall of the tube 10 leaving a longitudinally coherent uninterrupted gas channel or duct 20 extending along the length of the tube. As disclosed at column 2, lines 49-53, high brisance explosives such as PETN, RDX, HMX or TNT, etc., or mixtures thereof, are used as the coating substance. At column 2, lines 61 to 62, Persson states that it is also conceivable to make the layer 18 a solid or liquid explosive. Starting at column 2, line 63, Persson states:

> "It is essential only that the mechanical properties of the fuse are of such character that the channel is open along the entire length of the fuse and that the pressure wave primed by the detonating cap 12 is propagated in the longitudinal direction of the tube or hose to the detonating cap 16 in the form of a gaseous percussion or impact wave having high velocity such as 1,500 meters per second or more and sufficiently high pressure and elevated temperature to prime the detonating cap 16. This gaseous percussion or impact wave is propagated within the gas channel 20, the purpose of the layer 18 of explosive being by an exothermic chemical reaction to sustain the percussion wave while adding enough energy as to compensate for the losses which are connected with the deformation of the tube wall or the friction of the gas against the tube wall."

(b) It is seen that Persson deems it essential that the coating explosive be able to sustain a gaseous percussion or impact wave having high velocity, such as 1,500 meters per second or more, and sufficiently high pressure and elevated temperature to prime material, e.g., a detonator cap. Although the GAP polymer defined in Applicants' claims is properly described as a reactive or energetic material, it is not a high explosive material as required by Persson.

20. Claims 10 and 11 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Posson in view of Rabotinsky et al. U.S. Patent 6,347,566 ("Rabotinsky").

This ground of rejection is respectfully traversed for the following reasons.

Claim 10

21. The Examiner again characterizes Posson as providing "a reactive polymeric material" which, as is believed to have been amply demonstrated above, is an incorrect characterization. Contrary to the Examiner's statement, Posson does not teach a tubular fuse with a reactive polymeric material on the inner walls of the tubular form, citing Posson's Figure 5. The Examiner acknowledges that Posson fails to teach that the polymeric material is a paint and to remedy this acknowledged deficiency cites Rabotinsky as teaching a signal transmission device with a reactive polymeric material painted on the inside surface of a tubular form, citing Rabotinsky at column 3, lines 20-47. As noted at column 3, line 21 *et seq.* of Rabotinsky, the reactive material coated onto the tape may comprise known explosive/fuel mixtures or deflagrating compositions or a mixture thereof. In accordance with the necessity of a high explosive material noted by Persson, note column 6, lines 13-36 of Rabotinsky which lists a number of "high brisance explosives" which "typically [they] will comprise from about 52 to 92 percent by weight of the combined weight of explosive and fuel in an explosive-containing reactive material." (column 6, lines 32-36). As discussed in paragraph 9 above, adding or substituting the GAP material of Manzara into Posson's formulation would severely affect the desired brisance and other characteristics of Posson's formulation. Adding or substituting the high explosives of Rabotinsky to Posson's formulations would affect Posson's desired characteristics even more severely, making it impossible for Posson to attain his desired characteristics.

22. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Posson and Rabotinsky as applied to claim 10 (paragraph 21 above) and further in view of Manzara.

This ground of rejection is respectfully traversed for reasons given below.

Claim 11

23. The same comments apply here as discussed in paragraphs 9 and 21 above. The substitution of either Manzara's GAP material or Rabotinsky's high explosive paint for the inert polymer of Posson not only is not suggested by the combined references, but the combined references clearly teach away from any such ill-advised combination.

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In view of the foregoing, it is respectfully submitted that each of the pending claims is now in condition for allowance and such action is respectfully requested.

Respectfully submitted,

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